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EXAMINER
PERKINS, PAMELA E

ART UNIT	PAPER NUMBER
2822	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/684,967	**Applicant(s)** DREWES ET AL.	
	Examiner Pamela E. Perkins	**Art Unit** 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _01 February 2006_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-57_ is/are pending in the application.

4a) Of the above claim(s) _42-57_ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-3,5-24,26-37 and 39-41_ is/are rejected.

7)☒ Claim(s) _4,25 and 38_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)	4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) ☐ Notice of Informal Patent Application (PTO-152)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _2/1/06_.	6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the filing of the request for reconsideration on 1 February 2006. Claims 1-57 are pending; claims 42-57 are withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 7, 10, 12, 14, 16 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grynkewich et al. (6,911,156) in view of Engelhardt et al. (2002/0076572).

Grynkewich et al. disclose a method of forming a magnetic memory cell where a first conductive layer (22/24) is a blanket layer; providing a barrier layer (26) is a blanket layer over the first conductive layer (22/24) (col. 3, lines 13-23); providing a second conductive layer (28/30) as a blanket layer over the barrier layer (26) (col. 3, lines 19-65); providing a hard mask (32) over the second conductive layer (28/30), wherein the hard mask (32) defines the region in which the magnetic memory cell is formed (col. 3, line 66 thru col. 4, line 7); etching the second conductive layer (28/30) to form an upper portion of the magnetic memory cell (FIG. 1; col. 4, lines 8-12); forming a spacer (64) around the upper portion of the magnetic memory cell (FIG. 9; col. 6, lines 15-21);

etching the barrier layer (26) and the first conductive layer (22/24) to form a lower portion of the magnetic memory cell (FIG. 10; col. 6, lines 22-29); and oxidizing the magnetic memory cell (FIG. 2; col. 3, lines 13-43).

Although, Grynkewich et al. do not specifically teach wherein conductive particles of the first conductive layer may be thrown up along a sidewall of the magnetic memory cell as byproducts of the etching of the first conductive layer. It is inherent that byproducts are formed during an etching procedure.

Grynkewich et al. do not disclose transforming the conductive particles into nonconductive particles.

Engelhardt et al. disclose a method of forming a magnetic memory cell where first conductive layers (50) are formed over a substrate (12); providing a barrier layer (58) over the first conductive layers (50); providing a second conductive layer (70) over the barrier layer (58) (para. 62-70); and oxidizing the conductive layers, thereby transforming the conductive particles into nonconductive particles (para. 19 & 32).

Since Grynkewich et al. in view of Engelhardt et al. are both from the same field of endeavor, a method of forming a magnetic memory cell, the purpose disclosed by Engelhardt et al. would have been recognized in the pertinent art of Grynkewich et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Grynkewich et al. by transforming the conductive particles into nonconductive particles as taught by Engelhardt et al. to increase yield (para. 19 & 32).

Referring to claim 7, Grynkewich et al. disclose the barrier layer (26) comprises aluminum oxide and has a thickness within the range of about 5 to 30 Å[1] (col. 3, lines 50 & 51).

Referring to claim 10, Grynkewich et al. disclose the hard mask (32) comprises a material selected from the group consisting of silicon nitride and silicon carbide (col. 4, lines 3-7).

Referring to claim 12, Grynkewich et al. disclose etching the second conductive layer (28/30) comprises ion milling or reactive ion etching (col. 4, lines 8-12).

Referring to claim 14, Grynkewich et al. disclose wherein forming a spacer (64) comprises: depositing a layer of nonconductive material as a blanket layer over the upper portion of the memory cell; and anisotropically etching the layer of nonconductive material such that the horizontal portions of the layer are preferentially removed relative to the vertical portions of the layer (col. 6, lines 15-21).

Referring to claim 16, Grynkewich et al. disclose wherein anisotropically etching the layer of nonconductive material comprises ion milling or reactive ion etching (col. 4, lines 8-12; col. 6, lines 2-9).

Referring to claim 22, Grynkewich et al. disclose etching the barrier layer (26) and the first conductive layer (22/24) comprises ion milling (col. 6, lines 22-29).

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[1] 1 nm= 10 Å

Claims 2, 3, 11, 15, 24, 27, 30, 33-35, 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grynkewich et al. in view of Engelhardt et al. as applied to claim 1 above, and further in view of Berg et al. (5,756,366).

Grynkewich et al. in view of Engelhardt et al. disclose the subject matter claimed above except oxidizing the outer portions of the second conductive layer after it is etched to form the upper portion of the magnetic memory cell and partially oxidizing the first conductive layer such that at least a portion of the first conductive layer is transformed into an insulating material.

Referring to claim 27, Berg et al. disclose a method of forming a magnetic memory cell where a first conductive layer (20) is a blanket layer; providing a barrier layer (22) is a blanket layer over the first conductive layer (20); providing a second conductive layer (24) as a blanket layer over the barrier layer (22) (col. 2, lines 61-67); providing a hard mask (30) over the second conductive layer (24), wherein the hard mask (30) defines the region in which the magnetic memory cell is formed (col. 3, lines 4-15); etching the second conductive layer (24) to form an upper portion of the magnetic memory cell; etching the barrier layer (22) and the first conductive layer (20) to form a lower portion of the magnetic memory cell (Fig. 5; col. 3, lines 8-15); and oxidizing the magnetic memory cell (Fig. 6; col. 3, lines 16-32). Berg et al. further disclose partially oxidizing the second conductive layer (24) such that at least a portion of the second conductive layer (24) is transformed into an insulating material; and repeating the partial oxidizing and partial etching steps until the first conductive layer (20) forms a lower portion of the magnetic memory cell (col. 3, lines 16-32).

Referring to claim 2, Berg et al. disclose oxidizing the outer portions of the second conductive layer after it is etched to form the upper portion of the magnetic memory cell (Fig. 6, col. 3, lines 16-25).

Since Grynkewich et al. and Berg et al. are both from the same field of endeavor, a method of forming a magnetic memory cell, the purpose disclosed by Berg et al. would have been recognized in the pertinent art of Grynkewich et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Grynkewich et al. by oxidizing the outer portions of the second conductive layer after it is etched to form the upper portion of the magnetic memory cell and partially oxidizing the first conductive layer such that at least a portion of the first conductive layer is transformed into an insulating material as taught by Berg to prevent failure (col. 1, lines 46-62).

Referring to claims 3, 24 and 37, Berg et al. disclose oxidizing the outer portions of the first conductive layer and the outer portions of the second conductive layer to plasma oxidation and oxidizing the memory cell comprises subjecting the memory cell to plasma oxidation (col. 3, lines 20-26).

Referring to claim 30, Grynkewich et al. disclose the barrier layer (26) comprises aluminum oxide and has a thickness within the range of about 5 to 30 Å[2] (col. 3, lines 50 & 51).

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[2] 1 nm= 10 Å

Referring to claim 33, Grynkewich et al. disclose the hard mask (32) comprises a material selected from the group consisting of silicon nitride and silicon carbide (col. 4, lines 3-7).

Referring to claims 35 and 39, Grynkewich et al. disclose etching the first and second conductive layer (28/30) comprises ion milling or reactive ion etching (col. 4, lines 8-12).

Referring to claims 11, 15 and 34, Grynkewich et al. do not disclose the hard mask has a thickness within the range of about 500 Å to about 2000 Å and the layer of nonconductive material having a thickness within the range of about 5 nm to about 100 nm. It would have been obvious to one having ordinary skill in the art at the time invention was made for the hard mask to have a thickness within the range of about 500 Å to about 2000 Å and the layer of nonconductive material to have a thickness within the range of about 5 nm to about 100 nm disclosed in the claimed invention, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955).

Claims 5-9, 28, 29, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grynkewich et al. in view of Engelhardt et al. and Berg et al. as applied to claims 1 and 27 above, and further in view of Tehrani et al. (5,804,458).

Grynkewich et al. in view of Engelhardt et al. and Berg et al. disclose the subject matter claimed above except the first and second conductive layers comprising sublayers.

Tehrani et al. disclose a method of forming a magnetic memory cell where a first conductive layer (16) is a blanket layer; providing a barrier layer (18) is a blanket layer over the first conductive layer (16); providing a second conductive layer (17) as a blanket layer over the barrier layer (18) (FIG. 1; col. 3, lines 9-20); forming a spacer (22A) around the upper portion of a magnetic memory cell (FIG. 3; col. 3, lines 21-51); and etching to form the magnetic memory cell (FIG. 4; col. 3, lines 52-56). Tehrani et al. further disclose the first and second conductive layers comprising sublayers (col. 3, lines 14-18).

Since Grynkewich et al. and Tehrani et al. are both from the same field of endeavor, a method of forming a magnetic memory cell, the purpose disclosed by Tehrani et al. would have been recognized in the pertinent art of Grynkewich et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Grynkewich et al. by first and second conductive layers comprising sublayers as taught by Tehrani et al. to increase quality and improve arrays (col. 1, lines 39-64).

Referring to claims 5, 8, 28 and 31, Grynkewich et al. disclose the first conductive layer and second conductive layers comprising tantalum, nickel-iron, iridium-manganese, platinum-manganese, nickel-iron, cobalt-iron and /or tungsten nitride (col. 3, lines 19-33 & 57-65).

Referring to claims 6, 9, 29 and 32, Grynkewich et al. disclose the first conductive layer and second conductive layer having a thickness within the range of 5 to 500 Å[3].

Claims 13, 23, 26, 36, 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grynkewich et al. in view of Engelhardt et al. and Berg et al. as applied to claims 1 and 27 above, and further in view of Motoyoshi (6,855,563).

Grynkewich et al. in view of Engelhardt et al. Berg et al. disclose the subject matter claimed above except etching the magnetic memory cell using CO_2-NH_3 or CO-NH_3 as an etchant and the memory cell comprising a tunneling magnetoresistance (TMR) memory cell.

Motoyoshi discloses a method of forming a magnetic memory cell where a first conductive layer (131/132) is a blanket layer; providing a barrier layer (133) is a blanket layer over the first conductive layer (131/132); providing a second conductive layer (134) as a blanket layer over the barrier layer (133) (FIG. 1A; col. 7, lines 36-44); etching to form the magnetic memory cell (FIG. 1B; col. 8, lines 57-64); and forming a spacer (22A) around the magnetic memory cell (FIG. 1C; col. 9, lines 22-29). Motoyoshi further discloses etching the second conductive layer, the barrier layer and the first conductive layer using CO-NH_3 as an etchant (col. 9, lines 5-10). Motoyoshi also discloses the memory cell comprises a tunneling magnetoresistance (TMR) memory cell (col. 1, lines 10-18).

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[3] 1 nm= 10 Å

Since Grynkewich et al. and Motoyoshi are both from the same field of endeavor, a method of forming a magnetic memory cell, the purpose disclosed by Motoyoshi would have been recognized in the pertinent art of Grynkewich et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Grynkewich et al. by etching the magnetic memory cell using CO-NH_3 as an etchant and the memory cell comprising a tunneling magnetoresistance (TMR) memory cell as taught by Motoyoshi to reduce cell size and prevent mask alignment errors (col. 4, lines 29-52).

Claims 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grynkewich et al. in view of Engelhardt et al. as applied to claim 1 above, and further in view of Chen (6,647,913).

Grynkewich et al. in view of Engelhardt et al. disclose the subject matter claimed above except the nonconductive material having a low K value and etching using fluorocarbon or oxygen-based plasma.

Chen discloses a method of forming a magnetic memory cell where a first conductive layer (14) is a blanket layer; providing a barrier layer (12) is a blanket layer over the first conductive layer (14); providing a second conductive layer (16) as a blanket layer over the barrier layer (12); etching to form the magnetic memory cell (FIG. 1; col. 1, lines 54-60); and forming a spacer (50) of the nonconductive material around the magnetic memory cell (FIG. 5; col. 4, line 27 thru col. 5, line 10).

Referring to claim 17, Chen discloses the nonconductive material comprises silicon nitride and anisotropically etching the layer of nonconductive material comprises using a fluorocarbon as an etchant (col. 4, line 64 thru col. 5, line 5).

Referring to claim 18, Chen discloses the nonconductive material comprises diamond-like carbon and anisotropically etching the layer of nonconductive material comprises using oxygen-based plasma as an etchant (col. 4, line 64 thru col. 5, line 5).

Referring to claim 19, Chen discloses the nonconductive material comprises silicon carbide and anisotropically etching the layer of nonconductive material comprises using a fluorocarbon as an etchant (col. 4, line 64 thru col. 5, line 5).

Referring to claim 20, Chen discloses the spacer comprises a low k electrical insulator having a k value of less than about 3.5 (col. 4, lines 27-43).

Referring to claim 21, Chen discloses the spacer comprises a material selected from the group consisting of silicon nitride, diamond-like carbon, silicon carbide, silicon oxide, and aluminum oxide (col. 4, lines 36-43).

Since Grynkewich et al. and Chen are both from the same field of endeavor, a method of forming a magnetic memory cell, the purpose disclosed by Chen would have been recognized in the pertinent art of Grynkewich et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Grynkewich et al. by the nonconductive material having a low K value and etching using fluorocarbon or oxygen-based plasma as taught by Chen to increase yield and reliability (col. 2, lines 31-49).

Allowable Subject Matter

Claims 4, 25 and 38 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: prior art does not anticipate, teach, or suggest oxidizing the memory cell comprises using O^3 as an oxidant, at a flow rate within the range of about 100 sccm to about 500 sccm.

Response to Arguments

Applicant's arguments filed 1 February 2006 have been fully considered but they are not persuasive. As stated above, Grynkewich et al. in view of Engelhardt et al. disclose the method of forming a magnetic memory cell as described in claims 1 and 27.

In response to Applicant's argument that the Examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include ~~know~~ Knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. *In re McLaughlin*, 443 F.2d 1392; 170 USPQ 209 (CCPA 1971).

4/17/06

In response to Applicant's argument that prior art does not eliminate shorting caused by conductive particles, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1978).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pamela E. Perkins whose telephone number is (571) 272-1840. The examiner can normally be reached on Monday thru Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PEP

Mary Wilczewski
Primary Examiner